

Amendments to the Claims:

This listing of the claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Canceled)
2. (Canceled)
3. (Canceled)
4. (Currently Amended) ~~The detector of claim 1~~ A semitransparent optical detector comprising:
a semitransparent PIN diode having at least one polycrystalline semiconductor layer,
wherein the polycrystalline semiconductor is a polycrystalline alloy of silicon and germanium.
5. (Original) The detector of claim 4, wherein the polycrystalline alloy is microcrystalline.
6. (Currently Amended) The detector of claim 4 ~~1~~, wherein the PIN diode has another layer of at least one of an amorphous semiconductor and a microcrystalline semiconductor.
7. (Currently Amended) The detector of claim 4 ~~1~~, further comprising:
a transparent substrate upon which the PIN diode is disposed.
8. (Original) The detector of claim 7, further comprising:
a transparent conductor disposed on a surface of the PIN diode.
9. (Withdrawn) A method of making a semitransparent optical detector comprising:
fabricating an amorphous semiconductor PIN diode on a transparent conductor; and
recrystallizing the amorphous semiconductor.
10. (Withdrawn) The method of claim 9, recrystallizing further comprising:

placing the amorphous semiconductor in a processing furnace.

11. (Withdrawn) The method of claim 10, further comprising:
during recrystallizing, flowing a forming gas of H₂ and N₂ through the processing furnace.

12. (Withdrawn) The method of claim 11, further comprising:
raising a temperature in the processing furnace to at least about 800°C.

13. (Withdrawn) The method of claim 9, fabricating further comprising:
depositing amorphous silicon as the amorphous semiconductor.

14. (Withdrawn) The method of claim 9, recrystallizing further comprising:
depositing the transparent conductor on a transparent substrate; and
rapidly annealing the amorphous semiconductor with high intensity heat applied to a side thereof away from the transparent substrate.

15. (Withdrawn) The method of claim 14, further comprising:
exposing the amorphous semiconductor to an argon plasma before rapidly annealing.

16. (Withdrawn) The method of claim 9, recrystallizing further comprising:
exposing a region of the amorphous semiconductor to a laser pulse having sufficient energy to locally raise a temperature of the amorphous semiconductor above about 800°C.

17. (Withdrawn) A method of making a semitransparent optical detector comprising:
depositing a transparent conductor onto a transparent substrate; and
growing a polycrystalline PIN diode on the transparent conductor using high temperature thermal chemical vapor deposition.

18. (Withdrawn) The method of claim 17, growing the polycrystalline PIN diode further comprising:

raising a temperature at which growing is performed above about 800°C.

19. (Original) A semitransparent optical detector comprising:
a PIN diode having amorphous silicon P and N layers; and
an intrinsic I layer of an alloy of silicon and germanium.

20. (Original) The detector of claim 19 on a transparent substrate.

21. (Original) The detector of claim 20 wherein the substrate is glass.

22. (Original) The detector of claim 20 wherein the substrate is a polymer.

23. (Original) The detector of claim 20 wherein the substrate is silicon which is transparent at a wavelength greater than about 1100 nm.

24. (Original) The detector of claim 19, wherein the concentration of germanium in the I layer is graded from a relatively low concentration adjacent the P and N layers to a relatively high concentration in the interior of the I layer.

25. (Withdrawn) A method of making a semitransparent optical detector, comprising:
providing a transparent substrate;
depositing a transparent conductive layer on the substrate;
vacuum depositing at an elevated temperature a relatively thin P layer of doped amorphous silicon on the conductive layer;
providing germanium in a form of a GeH₄ gas component of a chemical vapor deposition gas;
vacuum depositing at an elevated temperature a relatively thick I layer of an amorphous alloy of silicon and germanium using the chemical vapor deposition gas;
vacuum depositing at an elevated temperature a relatively thin N layer of doped amorphous silicon on the conductive layer; and
depositing a transparent conductive layer on the N layer.

26. (Withdrawn) The method of claim 25, further comprising:
doping the P layer with boron.
27. (Withdrawn) The method of claim 25, further comprising:
doping the N layer with phosphorous.
28. (Withdrawn) The method of claim 25, further comprising:
bonding the substrate to a vertical cavity surface emitting laser (VCSEL) device.
29. (Withdrawn) The method of claim 25, wherein the substrate is a layer of a vertical cavity surface emitting laser (VCSEL) device.
30. (Withdrawn) The method of claim 25, further comprising:
integrating the substrate in a package for a laser device, in a light path of the laser.
31. (Withdrawn) The method of claim 25, further comprising:
varying a concentration of GeH₄ gas in the chemical vapor deposition gas to vary introduction of germanium into the alloy from a relatively low concentration for deposition at a boundary with the P layer, to a high concentration for deposition within the I layer, and to a relatively low concentration for deposition at a boundary with the N layer.
32. (Withdrawn) The method of claim 31, wherein the low concentration of GeH₄ gas is about 0% of the chemical vapor deposition gas and the high concentration of GeH₄ gas is selected to optimize photon absorption at a wavelength of interest.
33. (Withdrawn) The method of claim 31, wherein the low concentration of GeH₄ gas is about 0% of the chemical vapor deposition gas and the high concentration of GeH₄ gas is about 100% of the chemical vapor deposition gas.
34. (Canceled)

35. (Canceled)

36. (Canceled)

37. (Canceled)

38. (Canceled)

39. (Withdrawn) A method of making a semitransparent optical detector comprising:
providing a transparent substrate;
sputtering a transparent thin film conductor onto the substrate; and
forming a PIN diode on the transparent thin film conductor and the substrate.

40. (Withdrawn) The method of claim 39, wherein sputtering further comprises:
sputtering ZnO.

41. (Withdrawn) The method of claim 39, wherein sputtering further comprises:
sputtering SnO.

42. (Withdrawn) The method of claim 39, wherein sputtering further comprises
sputtering indium tin oxide.

43. (Currently Amended) A semitransparent optical detector comprising:
a thin film PIN diode which both detects and is semitransparent to light having a wavelength λ ;
a first ~~transparent~~ conductor at least partly covering and contacting a first surface of the PIN diode, the first conductor being semitransparent to light having the wavelength λ ;
a second ~~transparent~~ conductor at least partly covering and contacting a second surface of the PIN diode, the second surface being opposite the first surface and also being semitransparent to light having the wavelength λ ; and
a passivation layer covering and enclosing all edges of the PIN diode, defining an aperture ~~on one~~ exposing at least a portion of the first surface of the PIN diode thereof, and exposing a part of the second transparent conductor for contact thereto.

44. (Original) The detector of claim 43, the passivation layer having a hole defined therethrough, through which contact is made with the second transparent conductor.

45. (Original) The detector of claim 43, further comprising:
a patterned metal layer over the passivation layer, including a first conductor entering the aperture to contact the first transparent conductor and a second conductor contacting the second transparent conductor.

46. (Original) The detector of claim 45, wherein the second conductor contacts the second transparent conductor through a hole defined in the passivation layer.

47. (Currently Amended) ~~The detector of claim 43~~ A semitransparent optical detector comprising:

a thin film PIN diode;

a first transparent conductor at least partly covering and contacting a first surface of the PIN diode;

a second transparent conductor at least partly covering and contacting a second surface of the PIN diode;

a passivation layer covering and enclosing all edges of the PIN diode, defining an aperture on one surface thereof, and exposing a part of the second transparent conductor for contact thereto, wherein the first transparent conductor extends partly over the passivation layer; and layer, the detector further comprising:

a patterned metal layer over the passivation layer, including a first conductor contacting the first transparent conductor without entering the aperture and a second conductor contacting the second transparent conductor.

48. (Original) The detector of claim 47, wherein the second conductor contacts the second transparent conductor through a hole defined in the passivation layer.

49. (Original) The detector of claims 45 or 47, wherein the thin film PIN diode extends to a contact pad position and the first conductor defines a path on the surface of the PIN diode to the contact pad position.

50. (Currently Amended) The detector of claim 49, wherein ~~the~~ a region contacted by at least one of the first and second transparent conductors defines a limited active area less than all of the PIN diode.

51. (Original) The detector of claims 45 or 47, wherein the PIN diode has tapered edges, a top surface of the PIN diode having a smaller area than a bottom surface thereof.

52. (Original) The detector of claim 43, wherein the passivation layer is silicon nitride.

53. (Original) The detector of claim 43, wherein the passivation layer is silicon dioxide.

54. (Currently Amended) A method of monitoring an optical beam, comprising:
interposing a ~~transparent~~ photodetector in the optical beam between a light source and a light receiver, said photodetector being semitransparent to the optical beam and allowing the light beam to reach the light receiver after passing through the photodetector; and
measuring an output of the photodetector.

55. (Original) The method of claim 54, further comprising:
controlling the light source responsive to the measured output of the photodetector.

56. (Currently Amended) A small aperture semitransparent optical detector comprising ~~detector, comprising, in the order stated:~~

a first conductive layer;

a PIN diode which is semitransparent to and detects light of wavelength λ ~~having a first edge partially overlying the first conductive layer;~~

a passivation layer covering and enclosing all edges of the PIN diode and defining an aperture exposing on an upper surface of the PIN diode, wherein the first conductive layer

extends partially under the PIN diode and electrically contacts a bottom surface of the PIN diode leaving unobstructed a portion of the bottom surface directly opposite the aperture so that light can pass through the aperture into the diode and out of the bottom surface without being obstructed by the first conductive layer; and

a second conductive layer contacting the surface of the PIN diode through the aperture.

57. (Currently Amended) The detector of claim 56, wherein the second conductive layer covers the aperture and is a transparent to light of wavelength λ conductor covering the aperture, the detector further comprising:

a third conductive layer contacting the second conductive layer ~~transparent conductor~~ outside the aperture.

58. (Currently Amended) The detector of claim 56, wherein the first conductive layer extends under the PIN diode on only one side and the second conductive layer contacts the exposed surface of the PIN diode in an area that is generally ~~near a second edge~~ diagonally opposite where the first conductive layer extends under the PIN diode ~~edge~~.

59. (Canceled)

60. (Canceled)

61. (Canceled)

62. (Canceled)

63. (Canceled)

64. (New) The detector of claim 43, wherein the first transparent conductor extends partly over the passivation layer, the detector further comprising:

a patterned metal layer over the passivation layer, including a first conductor contacting the first transparent conductor without entering the aperture and a second conductor contacting the second transparent conductor.

65. (New) The detector of claim 56, wherein the first side of the PIN diode is one of the p-doped side and the n-doped side of the PIN diode and the exposed surface is of the other of the p-doped side and the n-doped side of the PIN diode.

66. (New) The detector of claim 56, further comprising a substrate onto which the first conductive layer is formed, wherein the substrate is transparent to light of wavelength λ , the first conductive layer defines an open area which exposes the underlying substrate, and the PIN diode is formed on the substrate in the open area and partially extending onto the first conductive layer.

Appln. No. 09/813,454
Amdt. dated June 9, 2004
Reply to Office Action of January 13, 2004

Amendments to the Drawings:

The attached 23 sheets of drawings showing Figs. 1-42 replace the original 18 sheets of drawing showing Fig. 1-42. We have put the drawings into better form.

Attachment: Replacement Sheets